

THE ORAL HEALTH OF AMERICAN INDIAN AND ALASKA NATIVE CHILDREN AGED 1-5 YEARS: RESULTS OF THE 2018-19 IHS ORAL HEALTH SURVEY

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KEY FINDINGS

1. Since 2010, early childhood caries has steadily declined nationally, and untreated early childhood caries in AI/AN preschool children has significantly declined.
2. Early childhood caries, however, continues to be a serious health problem for many AI/AN preschool children, despite declining rates.
3. Some IHS Areas and programs have had dramatic, statistically significant reductions in the prevalence of early childhood caries.
4. One out of every six **one-year old** AI/AN children suffer from early childhood caries.
5. While almost twice the national level, dental sealants on primary molars in AI/AN children may be underutilized.

DATA SOURCE

The primary data source for this brief is the 2018-19 IHS oral health survey of AI/AN children aged 1-5 years. A total of 9,275 AI/AN children were screened at 75 different IHS, tribal, and urban sites.

Early childhood caries (ECC), defined as tooth decay experience in children 0-5 years of age, is the most common health problem for American Indian and Alaska Native (AI/AN) preschool children, five times more common than asthma.¹ When compared to other population groups in the United States, AI/AN preschool children have the highest level of tooth decay, more than 4 times higher than white non-Hispanic children.² The reasons why AI/AN children have more tooth decay are not known but it may be partially due to differences in host, bacterial, behavioral, sociodemographic, and environmental risk factors.

If left untreated, ECC can have serious consequences by affecting a child's growth, causing pain and potentially life-threatening infection, and diminishing a child's overall quality of life. Due to their young age and an inability to cooperate for dental care, treatment of preschool children with ECC is often provided in a hospital-based operating room under general anesthesia, resulting in a significant financial burden. However, ECC is largely preventable through a combination of individualized and community-based strategies including community water fluoridation, dental sealants, use of fluoride toothpastes at home, professionally applied topical fluorides such as fluoride varnish, good infant feeding practices, a healthy diet low in sugar and refined carbohydrates, and regular dental visits starting when the first tooth emerges at about 4-12 months of age.

In 2010, the Indian Health Service (IHS) implemented an ongoing oral health surveillance system designed to monitor trends in oral health among the AI/AN population served by IHS and tribal programs. Since the implementation of the surveillance system, oral health data have been obtained from four different age cohorts; preschool children (2010, 2014 and 2018-19), elementary school children (2011-12 and 2016-17), adolescents (2012-13), and adults (2015). This data brief focuses on the oral health of preschool children. It presents information on the prevalence of ECC, untreated decay and dental sealants in the primary (baby) teeth of AI/AN children aged 1-5 years in 2018-19 and assesses trends in oral health since the 2010 survey. The results of the

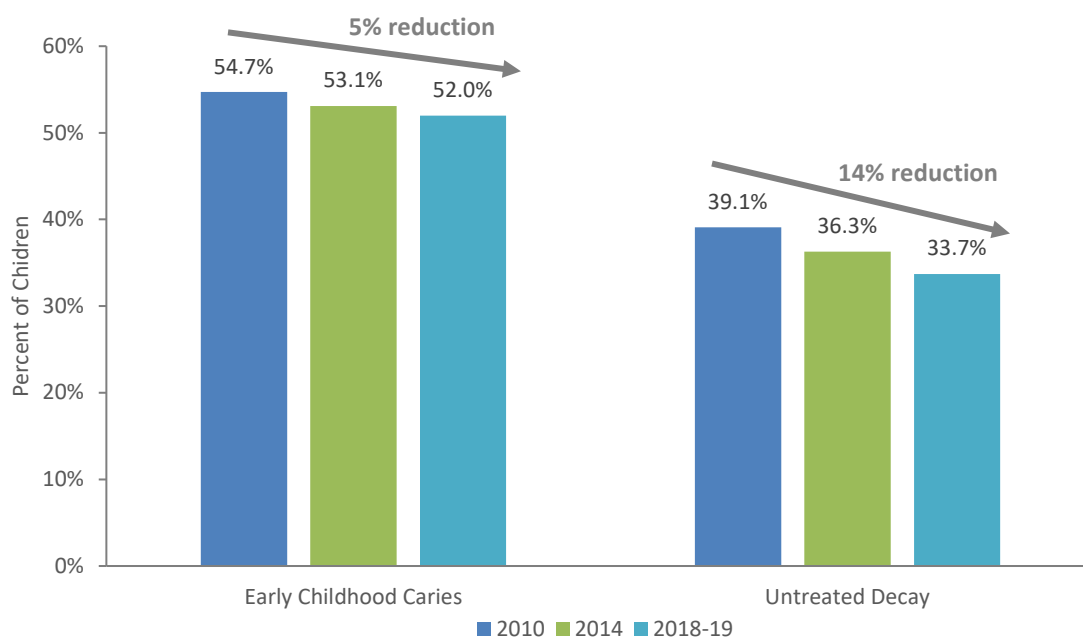
2018-19 oral health survey are presented as five key findings (sidebar)



KEY FINDING #1: SINCE 2010, EARLY CHILDHOOD CARIES HAS STEADILY DECLINED NATIONALLY, AND UNTREATED EARLY CHILDHOOD CARIES IN AI/AN PRESCHOOL CHILDREN HAS SIGNIFICANTLY DECLINED.

The Indian Health Service completed oral health surveys of AI/AN children 1-5 years of age in 2010, 2014 and 2018-19. To evaluate trends, we compared results for the 53 IHS/tribal service units that participated in all three surveys. In 2010, these 53 service units screened 7,632 children, in 2014 a total of 8,609 were screened and in 2018-19 7,343 were screened. Since 2010, there has been a steady decline in the prevalence of both early childhood caries and untreated decay among preschool children at these 53 service units (Figure 1). From 2010 to 2018-19, the prevalence of early childhood caries decreased from 55% to 52%, a reduction of 5% (not statistically significant) while the prevalence of untreated decay decreased from 39% to 34%, a 14% reduction (statistically significant, $p=0.04$). These results mirror national trends which found a non-significant reduction in decay experience and a significant reduction in untreated decay among U.S. children aged 2-19 years between 2011-2012 and 2015-2016.³

Figure 1. Prevalence of early childhood caries and untreated decay in AI/AN children 1-5 years of age at the 53 service units that participated in the 2010, 2014 and 2018-19 IHS oral health surveys



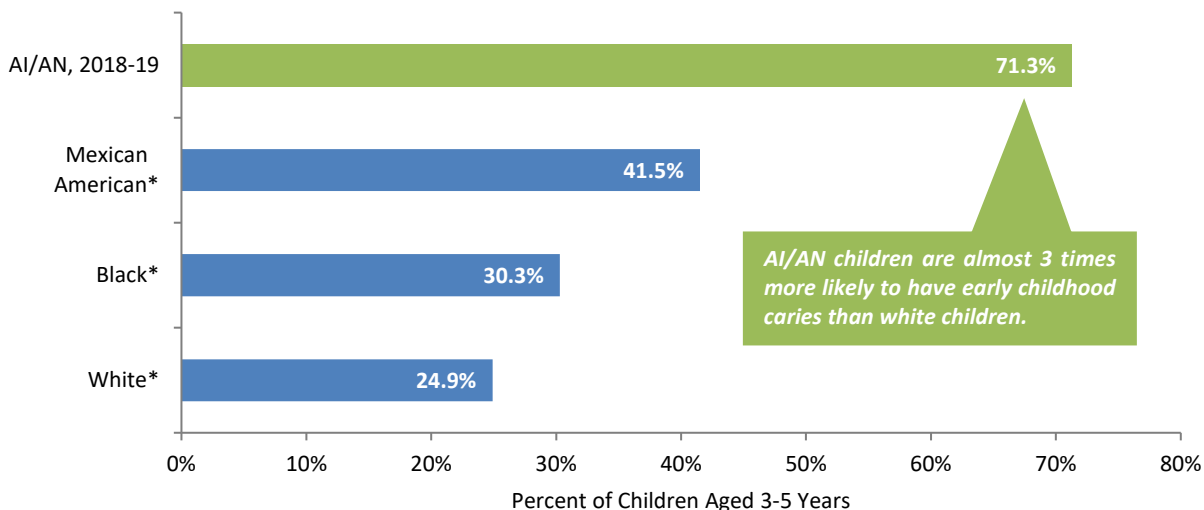
KEY FINDING #2: EARLY CHILDHOOD CARIES, HOWEVER, CONTINUES TO BE A SERIOUS HEALTH PROBLEM FOR MANY AI/AN PRESCHOOL CHILDREN, DESPITE DECLINING RATES.

More than half of AI/AN children between 1-5 years of age have early childhood caries. Left untreated, ECC can have serious consequences, including needless pain and suffering, difficulty chewing (which can compromise a child’s nutrition and slow their development), and impaired speech development. Because of their young age, many children with ECC must be treated in a hospital setting under general anesthesia, and full-mouth rehabilitation could cost as much as \$9,350 per child.⁴

As depicted in Figure 2, AI/AN preschool children 3-5 years of age have the highest prevalence of ECC of any population group in the United States, almost three times higher than white non-Hispanic children. When compared to other population groups, AI/AN children are also more likely to have untreated tooth decay. Slightly

more than 43% of AI/AN children between 3-5 years of age have untreated decay compared to only 10% of white non-Hispanic children (NHANES 2013-14); a 4-fold difference.

Figure 2. Prevalence of early childhood caries among children 3-5 years of age



* Data Source: National Health and Nutrition Examination Survey (NHANES), 2013-14

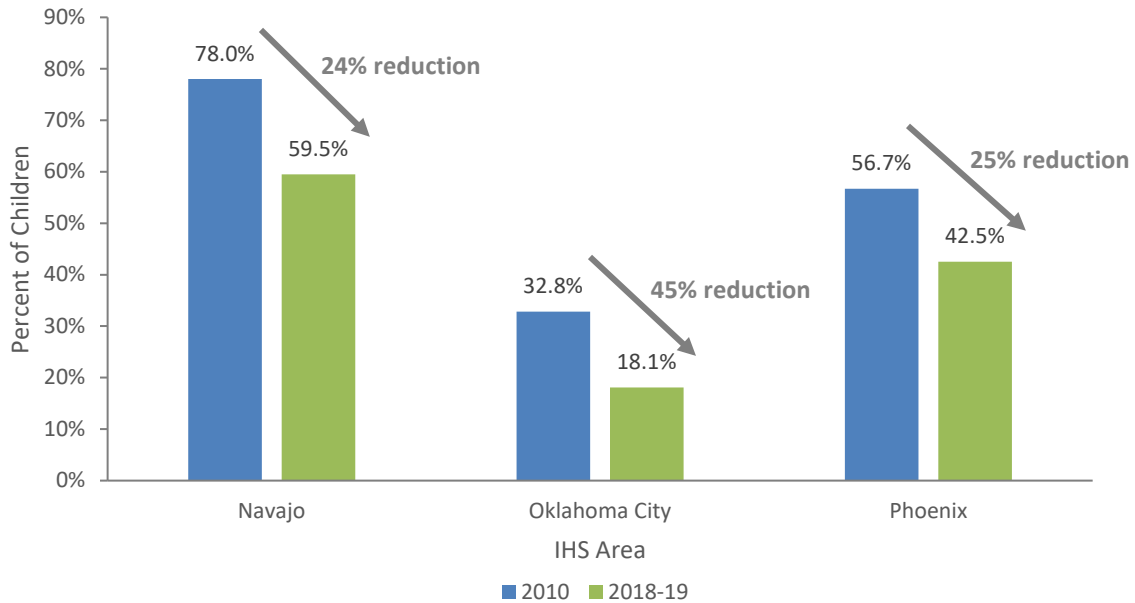
These disparities exist despite the implementation of tooth decay prevention programs by IHS and Tribes, including fluoridation of community water systems, the use of topical fluorides and dental sealants, and oral health educational programs for children and parents. There are probably several reasons why such a high percent of AI/AN children have ECC. Parents may not understand the benefits of early dental visits or the importance of treating decay in primary (baby) teeth. In addition, the relative geographic isolation of many tribal populations may limit AI/AN children’s access to preventive and restorative dental care.

KEY FINDING #3: SOME IHS AREAS AND PROGRAMS HAVE HAD DRAMATIC, STATISTICALLY SIGNIFICANT REDUCTIONS IN THE PREVALENCE OF EARLY CHILDHOOD CARIES.

We compared IHS Area results for the 53 IHS/tribal service units that participated in both the 2010 and 2018-19 oral health surveys. Three of the twelve IHS Areas had statistically significant reductions ($p < 0.05$) in the prevalence of ECC – Navajo, Oklahoma City and Phoenix (Figure 3). The Navajo Area had a 24% reduction in the prevalence of ECC while the Oklahoma City and Phoenix Areas had reductions of 45% and 25% respectively. Four other IHS Areas (Albuquerque, Billings, California and Tucson) had percentage reductions higher than the national average of 5%, but the differences were not statistically significant. For the remaining five IHS Areas, two had no change while three had non-significant increases in the prevalence of ECC.

In addition to reductions in the prevalence of ECC, several IHS Areas had statistically significant reductions ($p < 0.05$) in the prevalence of untreated decay (Albuquerque, Navajo and Oklahoma City) while five Areas had reductions higher than the national average of 14% that were not statistically significant (Billings, California, Great Plains, Phoenix and Tucson). Two Areas had reductions less than the national average and two Areas had non-significant increases in the prevalence of untreated decay. Through regular and ongoing surveillance, we will be able to determine if these trends continue.

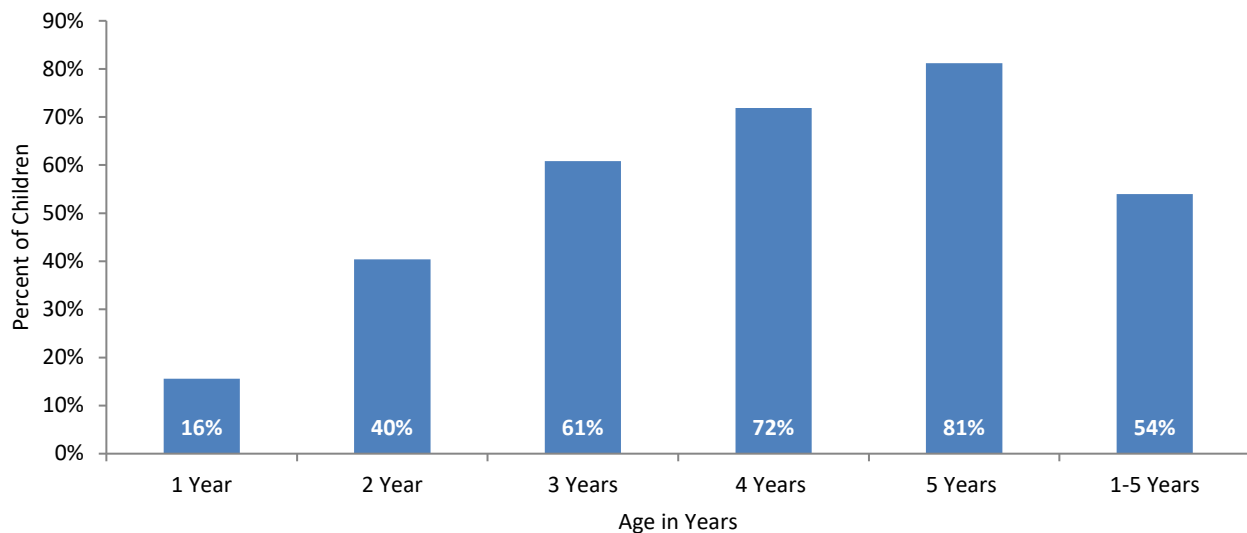
Figure 3. Prevalence of early childhood caries among AI/AN children 1-5 years of age for select IHS Areas, 2010 and 2018-19



KEY FINDING #4: ONE OUT OF EVERY SIX ONE-YEAR OLD AI/AN CHILDREN SUFFER FROM EARLY CHILDHOOD CARIES.

Oral health and general health are intertwined, and poor oral health can profoundly affect an infant’s or child’s health and well-being. Early childhood caries can result in pain, infection, the inability to chew foods well, embarrassment about damaged or discolored teeth, and distraction from play and learning. ECC in very young children is of special importance because dental treatment must generally be provided in a hospital-based setting with general anesthesia; putting a child at risk of complications associated with sedation. If left untreated, a primary (baby) tooth can abscess and abscessed primary teeth can potentially damage permanent teeth and increase a child’s vulnerability to infections in other parts of the body, such as the ears, sinuses and the brain.^{5,6}

Figure 4. Prevalence of early childhood caries among AI/AN children by age, 2018-19



For AI/AN children, early primary and secondary prevention efforts are critical because almost one out of every six 1-year olds (16%) already have ECC and the percentage with decay rises significantly with age (Figure 4). Although national data on the prevalence of ECC in 1-year-old children is not available, we know from anecdotal information that other population groups in the U.S. do not have this high of a prevalence at such a young age. For the primary prevention of tooth decay, the American Academy of Pediatrics recommends several strategies for enhancing the oral health of young children including but not limited to: parent/family education on oral health care (particularly on eating healthy nutritious foods, limiting sugars, and brushing teeth with a toothpaste containing fluoride); first preventive visit to a dentist within six months of the first tooth erupting and no later than age 1, with preventive check-ups thereafter; a series of topical fluoride applications to children's teeth; and, fluoridated public water supplies.⁷ Secondary prevention, the prompt and efficacious use of non-invasive ECC management techniques such as silver-ion products and interim therapeutic restorations, must also be encouraged because it provides an opportunity to stop ECC from ever progressing to the stage at which surgical intervention is required. Both primary and secondary ECC prevention should be a priority and fully integrated into routine medical and dental practice.⁸

KEY FINDING #5: WHILE ALMOST TWICE THE NATIONAL LEVEL, DENTAL SEALANTS ON PRIMARY MOLARS IN AI/AN CHILDREN MAY BE UNDERUTILIZED.

Dental sealants are thin plastic coatings that are applied to the grooves on the back teeth to protect them from tooth decay. Most tooth decay in children occurs on these surfaces. Sealants protect the chewing surfaces from tooth decay by keeping bacteria and food particles out of these grooves. A review of available evidence found that sealants reduce the risk of new decay by 76%.⁹ Only 7% of AI/AN children 1-5 years of age have at least one dental sealant on a primary molar tooth. The percentage of children with dental sealants increases with age from 2% among 1-2 year olds to 10% among 3-5 year olds; higher than the national average of 4% for children 3-5 years (NHANES 2011-12). Although the prevalence of sealants among 3-5 year old AI/AN children is higher than the national average, more AI/AN children need this proven preventive service. The American Dental Association and the American Academy of Pediatric Dentistry both recommend the use of sealants in primary (baby) molars.⁸ The IHS Division of Oral Health further recommends the use of glass ionomer sealants for partially erupted teeth and pre-cooperative patients.

IMPLICATIONS

Data from the IHS oral health surveillance system suggest that the oral health of some AI/AN preschool children is improving. Regardless of these improvements, AI/AN children continue to suffer disproportionately from the burden of oral disease. To address this disparity, IHS and tribal programs must continue to engage the individual, family, community, tribal leadership, plus health and social service providers to ensure that all AI/AN preschool children have access to age appropriate, evidence-based primary prevention strategies along with methods for managing the early stages of disease and, when primary or secondary prevention fails, appropriate restorative dental care.

DATA SOURCES AND METHODS

The primary data source for this brief is the 2018-19 IHS oral health survey of AI/AN preschool children aged 1-5 years. The sampling frame for the 2018-19 survey consisted of all IHS/tribal service units with an estimated 1-5 year old user population of 20 or more children. A stratified probability proportional to size (PPS) cluster sampling design was used to select IHS/tribal service units. The sampling frame was stratified by IHS Area, and service units

were sorted within each Area based on operational status (tribal or IHS) and/or state. A systematic PPS sampling scheme was used to select 69 service units. If a service unit refused to participate, another service unit within the same sampling interval was randomly selected. Data is available for 63 of the 69 sampling intervals. Twelve service units that were not in the original sample volunteered to participate.

The following information was collected for each child: age, sex, race, tooth specific caries and sealant status plus treatment urgency. We used the *Basic Screening Survey* clinical indicator definitions and data collection protocols.¹⁰ Race was recorded as AI/AN or other. Only children classified as AI/AN were included in the analyses.

Examiners included dentists, dental hygienists and dental therapists employed by IHS or tribal programs. Examiners were required to view an examiner training webinar; no formal calibration was undertaken, and examiner reliability was not assessed. Screenings were completed in community-based settings using dental mirrors and an external light source. Examiners collected data using paper forms which were mailed to a central location. All statistical analyses were performed using the complex survey procedures within SAS (Version 9.4; SAS Institute Inc., Cary, NC). Sample weights were used to produce population estimates based on selection probabilities.

The secondary data sources for this brief are the 2010 and 2014 IHS oral health surveys of AI/AN preschool children. In 2010, almost 8,500 AI/AN children aged 1-5 years were screened at 63 different Tribal and IHS sites across the country while in 2014 over 11,800 AI/AN children were screened at 81 different sites. Detailed survey methods have been published elsewhere.^{11,12}

DEFINITIONS

Early childhood caries (ECC): Refers to having treated or untreated decay including teeth that were extracted because of tooth decay.

Untreated decay: Describes dental cavities or tooth decay that have not received appropriate treatment.

Dental sealants: Describes plastic-like coatings applied to the chewing surfaces of back teeth. The applied sealant fills the grooves of teeth to form a protective physical barrier.

ABOUT THE AUTHORS

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REFERENCES

1. American Academy of Pediatric Dentistry. Early Childhood Caries Fact Sheet. <http://www.mychildrensteeth.org/assets/2/7/ECCstats.pdf>, Accessed 15 April 2019.
2. Phipps KR and Ricks TL. The oral health of American Indian and Alaska Native children aged 1-5 years: results of the 2014 IHS oral health survey. Indian Health Service data brief. Rockville, MD: Indian Health Service. 2015.
3. Fleming E, Afful J. Prevalence of total and untreated dental caries among youth: United States, 2015–2016. NCHS Data Brief, no 307. Hyattsville, MD: National Center for Health Statistics. 2018.

4. Atkins CY, Thomas TK, Lenaker D, et al. Cost-effectiveness of preventing dental caries and full mouth dental reconstructions among Alaska Native children in the Yukon-Kuskokwim delta region of Alaska. *J Public Health Dent* 2016;76:228-40.
5. Fung MHT, Wong MCM, Lo ECM, Chu CH. Early Childhood Caries: A Literature Review. *J Oral Hyg Health* 2013; 1:107.
6. Moazzam AA, Rajagopal SM, Sedghizadeh PP, Zada G, Habibian M. Intracranial bacterial infections of oral origin. *J Clin Neurosci* 2015;22(5):800-6.
7. American Academy of Pediatrics. How to prevent tooth decay in your baby. Available at: <https://www.healthychildren.org/English/ages-stages/baby/teething-tooth-care/Pages/How-to-Prevent-Tooth-Decay-in-Your-Baby.aspx>. 2015.
8. Pitts N, Zero D. White paper on dental caries prevention and management: a summary of the current evidence and the key issues in controlling this preventable disease. FDI World Dental Federation, 2016. Available at: https://www.fdiworlddental.org/sites/default/files/media/documents/2016-fdi_cpp-white_paper.pdf.
9. Wright JT, Crall JJ, Fontana M, et al. Evidence-based Clinical Practice Guideline for the Use of Pit-and-Fissure Sealants. American Academy of Pediatric Dentistry, American Dental Association. *Pediatr Dent* 2016; 38(5):E120-E36
10. Association of State and Territorial Dental Directors. Basic screening surveys: an approach to monitoring community oral health. Available at: <http://www.astdd.org/basic-screening-survey-tool/>.
11. Indian Health Service. The 2010 Indian Health Service Oral Health Survey of American Indian and Alaska Native Preschool Children. Rockville, MD: U.S. Department of Health and Human Services, Indian Health Service, 2014.
12. Phipps KR and Ricks TL. The oral health of American Indian and Alaska Native children aged 1-5 years: results of the 2014 IHS oral health survey. Indian Health Service data brief. Rockville, MD: Indian Health Service. 2015.

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DATA TABLES

Table 1. Number and percent of 1-5 year old AI/AN children screened by selected characteristics, 2018

Characteristic	Number	Unweighted Percent	Weighted Percent
Age			
1 year	1,060	11.4	19.9
2 years	1,246	13.4	19.9
3 years	2,459	26.5	20.0
4 years	3,064	33.0	20.0
5 years	1,446	15.6	20.0
Sex			
Female	4,607	49.7	49.7
Male	4,536	48.9	48.4
Unknown	132	1.4	1.9

Table 2: Number of AI/AN children screened by IHS Area and age, 2018 (not weighted)

IHS Area	1 Year	2 Years	3 Years	4 Years	5 Years	Total
Alaska	40	42	142	203	121	548
Albuquerque	69	81	155	213	111	629
Bemidji	68	79	282	235	99	763
Billings	154	163	328	410	202	1,257
California	65	79	103	98	89	434
Great Plains	101	143	237	296	108	885
Nashville	102	116	231	236	161	846
Navajo	61	85	135	147	99	527
Oklahoma City	155	187	417	570	204	1,533
Phoenix	86	85	106	127	77	481
Portland	136	146	218	346	126	972
Tucson	23	40	105	183	49	400
Total	1,060	1,246	2,459	3,064	1,446	9,275

Table 3: Percentage of AI/AN children with decay experience, untreated decay, arrested decay, primary molar sealants, and urgency of need for dental care by age in years, 2018

Variable	1 Year (n=1,060)		2 Years (n=1,246)		3 Years (n=2,459)		4 Years (n=3,064)		5 Years (n=1,446)	
Decay Experience	15.6		40.4		60.8		71.9		81.2	
(95% CI)	8.3	22.8	32.4	48.4	54.6	66.9	66.0	77.9	78.6	83.8
Untreated Decay	13.4		31.1		41.8		43.3		45.0	
(95% CI)	7.6	19.2	25.4	36.8	36.4	47.2	36.9	49.6	41.1	49.0
Arrested Decay	1.3		4.8		4.1		3.5		3.9	
(95% CI)	0.0	2.7	2.2	7.3	1.3	6.9	1.4	5.6	1.8	6.0
Primary Molar Sealants	0.8		3.0		7.1		8.2		14.2	
(95% CI)	0.0	1.8	1.4	4.7	4.4	9.8	5.8	10.6	9.5	18.9
Early or Urgent Care*	13.9		30.9		40.8		42.4		44.7	
(95% CI)	8.4	19.3	25.0	36.8	35.2	46.4	35.9	48.9	41.1	48.3
Urgent Care*	2.1		4.9		6.7		6.5		10.2	
(95% CI)	0.5	3.8	2.4	7.5	4.1	9.3	4.5	8.5	6.4	14.0

* Information on treatment urgency was missing for 96 children

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Table 4: Mean number of decayed, arrested, missing and filled teeth (dmft) and mean percent of erupted teeth with decay experience among AI/AN children by age in years, 2018

Variable	1 Year (n=1,060)		2 Years (n=1,246)		3 Years (n=2,459)		4 Years (n=3,064)		5 Years (n=1,446)	
	Decayed Teeth (95% CI)	0.26	0.73	0.94	1.68	1.60	2.44	1.60	2.27	1.63
Arrested Decay Teeth (95% CI)	0.04	0.07	0.06	0.22	0.05	0.21	0.04	0.18	0.04	0.19
Missing Teeth (95% CI)	0.03	0.05	0.05	0.55	0.31	0.66	0.50	1.03	0.80	1.31
Filled Teeth (95% CI)	0.03	0.06	0.31	0.67	1.14	1.85	2.21	3.05	3.04	3.68
dmft (95% CI)	0.59	0.88	1.53	2.97	3.44	4.82	4.71	6.17	6.03	6.99
Percent of Teeth* (95% CI)	3.9%	5.9%	8.1%	15.6%	17.2%	24.1%	23.6%	30.9%	31.1%	36.1%

* Percent of erupted primary teeth with decay experience.

Table 5: Percent of AI/AN children with decay experience, untreated decay, arrested decay, primary molar sealants, and urgency of need for dental care by age group, 2018

Variable	1-5 Years (n=9,275)		2-5 Years (n=8,215)		3-5 Years (n=6,969)	
	Decay Experience (95% CI)	54.0	59.0	63.6	68.3	71.3
Untreated Decay (95% CI)	34.9	38.7	40.3	43.9	43.4	47.3
Arrested Decay (95% CI)	3.5	5.2	4.1	6.1	3.8	6.0
Primary Molar Sealants (95% CI)	6.7	8.6	8.1	10.5	9.8	12.5
Early or Urgent Care* (95% CI)	34.5	38.1	39.7	43.4	42.6	46.7
Urgent Care* (95% CI)	6.1	7.8	7.1	9.0	7.8	9.8

* Information on treatment urgency was missing for 96 children

Table 6: Mean number of decayed, arrested, missing and filled teeth (dmft) and mean percent of erupted teeth with decay experience among AI/AN children by age group, 2018

Variable	1-5 Years (n=9,275)		2-5 Years (n=8,215)		3-5 Years (n=6,969)	
Decayed Teeth (95% CI)	1.55		1.81		1.98	
	1.32	1.78	1.57	2.05	1.71	2.25
Arrested Decay Teeth (95% CI)	0.11		0.12		0.12	
	0.06	0.15	0.07	0.18	0.05	0.18
Missing Teeth (95% CI)	0.53		0.65		0.77	
	0.38	0.67	0.47	0.84	0.59	0.95
Filled Teeth (95% CI)	1.60		2.00		2.50	
	1.39	1.82	1.74	2.26	2.18	2.81
dmft (95% CI)	3.79		4.58		5.36	
	3.30	4.28	4.04	5.13	4.83	5.89
Percent of Teeth* (95% CI)	19.5%		23.4%		27.2%	
	16.9%	22.0%	20.6%	26.1%	24.5%	29.8%

* Percent of erupted primary teeth with decay experience.

SUGGESTED CITATION

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